

One of the trees had a close, smooth bark, and the other a thicker, rough, corrugated bark. There was considerable difference in the diameter of the two trees, the smooth one being about 16 cm., and the rough one about 28 cm. in diameter. To eliminate the influence of this difference in volume as much as possible, the borings were made on the south side of the tree to the depth of 6 cm. Reference to diagram E will show the temperatures of the two trees. *a* indicates the rough barked, and *b* the smooth barked poplar. On some days there was a difference of 6 to 10 degrees in the temperatures, the smooth barked tree being the warmer. It was noticeable that on cloudy days, as were the 17th and 18th, that the variation was not so marked. Although the larger volume of *a* would have a tendency to lower its temperature, yet it hardly seems possible that anything like this difference would be caused on this account.

Lack of time at present, prevented further experiments being made upon this point, but the above results point, I think, toward the conclusion, even if they do not warrant us in stating positively that the direct absorption of heat is the main cause of the higher temperature of trees, and that it is largely dependent upon the character of bark.

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EXPLANATION OF PLATE XVIII.—Vertical scale 1° C.=.1 inch. Horizontal scale, 12 hrs.=.6 inch. A, Showing difference in temperature between evergreen and deciduous trees. B, Showing difference in temperature between evergreen and deciduous conifers. (Period from 16th to 19th indicates continuous rainy weather.) C, Influence of denudation of foliage upon temperature of conifers. C¹, Before stripping off foliage from tree. C², After stripping off foliage from tree; *a*=tree that was stripped; *b*=tree used for control experiment. D, Showing difference in temperature between woods of different densities compared with temperature of the air. E, Showing difference in temperature between two trees of the same species, with bark of different nature.

Paraguay and its flora. I.

THOMAS MORONG.

Land of heat probably most people in the Northern United States would say, if they thought of it at all. True enough, for the mercury in the Fahrenheit thermometer hanging in

my room averaged from November 1 to the middle of April 80° night and day, and sometimes rose to nearly 100° , while in the sun out of doors it easily marked 110° . Even now (July) in the month corresponding to our January, it stands much of the time at 65° and 68° , and has only occasionally fallen as low as 40° . Land that rarely knows a slight frost, in which stoves are nearly unknown, where the windows are generally without glass, where the country people sleep and almost literally live out of doors; land of the most delicious atmosphere to one who likes warmth as well as I do; where rheumatism, neuralgia, consumption and their kindred diseases seldom occur; land that for these very reasons possesses a rich and varied vegetation, it is necessarily a land full of surprises and of rare interest to a botanist from a colder climate. Around him, with trunks tall and straight as a column, and with their graceful, drooping fronds rustling in the slightest breeze, stand several species of that monarch of the floral world, the palm. The most common species about Asuncion, popularly called the "Coco" or "Pindo," is the *Cocos australis*, which rises to the height of thirty or forty feet. This tree bears a true cocoa-nut, about the size of a marble, an inch and a half in diameter. I could hardly believe it to be a cocoa-nut until I split one of the fruits in two and ate the contents. The meat is as good as that of its larger brothers for aught that I can see. It yields an excellent oil, and is often here ground and pressed in mills for that purpose. The foliage furnishes a very good fodder for cattle, and is occasionally used for thatching roofs. No boys, however, would venture to climb the tree in order to get the fruit, for the trunk is armed over its whole length with long, sharp thorns, some of them at least five inches in length, wounds from which are said to fester in the flesh. Two other species of the palm are common in Paraguay, the *Cocos sclerocarpa*, similar to the Pindo, but with a smooth trunk, and a smaller-sized tree which has nearly erect, fan-shaped leaves, and bears a large panicle of small berries (*Livistona?*). Across the river Paraguay, in the territory known as the "Gran Chaco," another and a very different species, known as the "Palma negra" (*Copernicia cerifera* Mart.) is very abundant. Its wood is exceedingly hard and durable, and much used for building purposes. The fruit of this palm is a large cluster of one-seeded berries, and its long roots furnish Carnauba, a well-known drug of commerce.

Another thing in this vicinity which reminds one that he is

within the tropics is the castor oil bean (*Ricinus communis* L.) which grows most vigorously in waste ground, often attaining a height of twenty or twenty-five feet, and producing an abundance of beans. "Castoria" is not to be found in the drug stores notwithstanding. From their utter neglect of this plant, I infer that the Paraguayans do not appreciate the virtues of castor oil. Even the Guarani women, who are great "herb doctors," pass the *Ricinus* by.

Perhaps, however, the thing which has interested me the most is a plant belonging to my own particular line of study. Few naturalists of North America or Europe can boast of having visited and gathered the *Victoria regia* in its native home, but that has been the good fortune of your correspondent, for it is quite common in the lagoons of the Paraguay river. To my eye, however, the flowers, although gigantic, have not half the loveliness and none of the delicious fragrance of our aquatic queen, the *Castalia odorata*. Their very immensity mars their beauty, and what is worse, in the estimation of the collector, the lower part of the calyx and the pedicel are covered with spines, which makes its collection a work of some difficulty. The pads of this monstrous water lily might well serve as a child's boat, for they are often as much as three feet in diameter, with an erect edge some two inches in height. Once, when gathering specimens, I thought I would test the buoyant capacity of the leaves. With much labor, I waded out into the lagoon, and, at considerable risk of a ducking, succeeded in placing a foot upon each of two adjoining leaves. They supported my weight with ease, sinking a few inches only, but not sufficiently to allow the water to run over the rims. So it is entirely within bounds to say that the pads are able to bear a weight of fifty pounds without difficulty.

Cacti are not numerous in this region, though several species occur. One of them is an *Opuntia*, similar in flower to my old Nantucket friend, *Opuntia vulgaris*. It is here called the "Tuna," or Indian fig, and grows as high as one's head, with many spreading branches, and bearing an orange-colored fruit as large as a hen's egg. Two species of *Cereus*, with beautiful large silvery flowers, are also found. One of these, which has a thick trunk protected by many rows of formidable spines, is columnar, often attaining a height of twenty feet or more, and sometimes splitting into several upright branches, which remind you of the pictures of the old Roman candelabra. This is occasionally used for making

hedges. Still another form is a genuine tree cactus, or, at least, it has a trunk looking exactly like that of a smooth tree, and throws out limbs from the top in arborescent fashion. It seems to be an *Opuntia*, as it has the flat lobes and the flowers and fruit of that genus.

I notice a number of *Agaves*, with towering flower stems from fifteen to twenty feet in height. I know that it is said that the *Agave* plant dies after flowering once. That may be so with what we call at home the Mexican *Agave*, which is frequently cultivated here, and which I have not seen in flower, but I am strongly inclined to think that it is not the case with another species which is a native of Paraguay, and plants of which I often see in flower. I am sure that I have seen, more than once, living plants with the withered stalks of last year's flowers upon them. I do not think that I can be mistaken in calling this an *Agave*, as it has the tall spike and the peculiar flowers and fruit of that genus. However, I do not wish to be dogmatic upon the question, and leave the matter for further investigation.

Yuccas are numerous, some of them quite diminutive and others which thrust their radiating spear-like leaves over an area six or eight feet in diameter, and throw up a flower stalk of equal height. Akin to the *Yucca*, at all events in general appearance, if in no other point, is a very striking plant which belongs to the *Bromeliaceæ* (possibly *Bromelia Caraguata*, as some botanists name it). The native Guarani name of the plant is "*Caraguata*," and many of the common people, who seem to recognize its affinities intuitively, call it the "*wild pine-apple*." This has numerous long and stiff dagger-like leaves, with hooked spines on their edges, and in its center a rosette of brilliant scarlet foliage, which can be seen for a long distance. The flowers are white, on a thick caudex, at length producing a huge bunch of fig-like fruit, which remind one, indeed, of the pine-apple, but are by no means sweet and luscious to the taste. The brilliant coloring of the leaves disappears altogether after flowering, and nothing remains of it in the dried specimens. Mr. Ball ("*Notes of a Naturalist in South America*," p. 210) calls this a plant peculiar to the Chilian flora, but he is mistaken, as it is equally common in Paraguay, and has long been known to the inhabitants as one of the many wild plants which can be used in the manufacture of textile fabrics. The fibers of the leaves, when properly treated, split into fine threads, forming an excellent material for cordage and

cloth. Like the "Chacuar," which is either the same or a similar species that grows in the Chaco australis, its threads have been employed by the Indians from time immemorial for making various articles, such as garments, cords, fishing-nets, baskets, and even coats of mail, which are said to be impenetrable by arrows. Several other species of the same family are found here, all of which can be used for the same purposes. One of these, which I have collected, grows upon ledges of red sandstone, and has a tall scape of flowers with scarlet bracts and calyx and bright blue petals.

Of forest trees it may be said that no pine, oak, ash, hemlock, spruce, hickory or maple is known to occur in Paraguay, but the country produces many interesting and valuable woods. With few exceptions they are very compact and durable, and susceptible of a fine polish, but they are generally too cross-grained, knotty and tough to serve for house-timber. Beams made of them are as heavy and solid as iron. The Quebracho colorado, for instance, which is often used in building railroad bridges, furnishes timbers which will support enormous weights and last for years, but the wood is so hard that it can scarcely be cut with a knife. These woods serve admirably for cabinet work, and especially for the turning-lathe. I have seen beautiful cups, goblets, card baskets, and other ornamental objects turned from them, and for veneering many of them are not surpassed in grain, color, delicate markings, and susceptibility of polish by mahogany, black walnut or birch. Among the handsomest trees which I have met is the "Timbo" (*Enterolobium timbosa*), which grows sometimes to the height of seventy-five or a hundred feet, with wide-spread and symmetrical branches, and long, pinnate leaves, forming a very ornamental shade tree. The wood is employed in making boats and canoes, but not otherwise good for much as timber. Half a dozen other species of *Enterolobium*, all inferior to the Timbo, grow in the Paraguayan forests. Another, but much smaller tree, common in this vicinity, is one of the mulberry family (*Broussonetia* probably). This has an umbrella-like head of large, drooping, palmate leaves that are smooth and shining above, and silvery woolly beneath, and presents an appearance quite as striking to the eye as the palm. Its flowers are diœcious, both the staminate and pistillate, in long, finger-shaped spikes, densely packed together upon a common cylindrical receptacle.

The best wood for furniture and all kinds of house-finish-

ing is furnished by the tree here called the cedar. It is light, straight-grained and red at the heart like our North American savin. Strangely enough, however, it belongs to the mahogany family (*Cedrela Brasiliensis*), but, unlike its congener, it is a soft wood comparatively.

Asuncion, Paraguay.

BRIEFER ARTICLES.

Abnormal roses.—Freaks are not rare among roses. In the *GAZETTE*, Vol. IX, p. 177, W. W. Bailey mentions "a garden rose in which, in the center of the rosette of petals, was a perfect but unopened bud." E. B. Harger, Vol. X, p. 214, notes that "on a common double climbing red rose" appeared "a sprout on which grows a whorl of four bracts subtending a cluster of ordinary petals, giving the appearance of a stem growing through the center of the rose." Further examples in this line of variation may be worth noting. A rose-bush on our campus has for the past five years produced only "single" roses and in scanty quantity. Last year the plant was divided at the roots into six parts and transplanted. Early in June, a little more than a year having passed, there appeared an abundance of dark red, velvety, double roses which challenged the admiration of every passer-by. Many of these roses exhibited a peculiar freak. One-third of the whole number showed variations. On one bush were six or seven with the stems produced through the center of the flower. In one case the stem developed two perfect expanded leaves, two leaf buds and a flower-bud, all immediately above the original rose, which was itself large and beautiful. In another instance the result is a "head" of five unopened flower-buds, each showing calyx, corolla and pistils. Other specimens show one, two, three and four of these "secondary" flowers above the roses proper. The principal flower in each case has its sepals and petals in natural condition; the stamens wanting or appearing as modified petals, while the pistils are entirely replaced by the new stem growth which rises an inch or more above the primary rose.—C. B. ATWELL, *Evanston, Ill.*

Dr. A. B. Ghiesbrecht.¹—The Mexican journal, *La Naturaleza*, has published a graceful tribute from the pen of a native botanist to the services of a Belgian explorer of the flora of his adopted country. For the career of a traveling naturalist Dr. Ghiesbrecht was well equipped physically and by preliminary studies at the universities of Brussels and Paris. Associated with Linden and Funk in the commission appointed by the Belgian government in 1837 to investigate the botany and zoology of

¹ *Vida y Trabajos del Naturalista Belga Augusto B. Ghiesbrecht, Explorador de Mexico, por el Sr. D. José N. Rovirosa.*